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ABSTRACT

Results of two studies of the relationship of flexibility and speed of closure with structural, lexical, and concrete/abstract cloze deletion strategies were compared. The first study used 113 high school students as subjects, and the second used 92 college students. All were given a variety of cloze tests and adapted portions of tests of associational fluency and verbal comprehension. Intercorrelations were computed for each experimental group, and factor analyses were made. Marked differences were noted between the high school and college groups. The high school sample had 65 of 66 significant ($p<.05$) correlations, while the college sample had 32 of 66. Fifteen of the 16 perceptual ability correlations were significant for the high school sample compared to five for the college sample, all verbal ability measures were significant for the high school sample compared to 10 of 16 for the college sample, and the magnitude of all relationships were higher for the high school group. Factor analysis revealed similar results for the two groups with a general cloze factor emerging first, followed by a perceptual factor, and a verbal ability factor. It was concluded that the studies lend support to a differentiation hypothesis of varying difficulty from one age level to another. (MS)

Cloze and Closure: A Second Analysis

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A previous study (Ohnmacht, Weaver, and Kohler, 1970) examined the relationship of flexibility and speed of closure with a number of cloze tasks representing structural, lexical, concrete, and abstract deletion strategies. Measures of vocabulary and associational fluency were included in the study with the hope that separable portions of cloze variation, representing communalities with verbal and perceptual abilities, could be identified through application of factor analytic techniques. The findings, based on 113 high school Ss, indicated that the cloze tasks could be differentiated into two discriminable dimensions. Further, perceptual abilities exhibited relatively low but significant correlations with all of the cloze tasks.

More recently, (Ohnmacht and Fleming, 1971) replicated the aforementioned study with a sample of 92 college students as subjects. The first part of this paper summarizes these new data and contrasts the findings with those reported earlier. The second part of the paper considers the findings from a linguistic perspective.

METHOD

A battery of twelve sub-tests was administered to samples of 113 high school and 92 college students. The high school sample spanned grades 9 through 12 and was drawn from a semi-rural school in Northeastern Georgia. The college sample consisted of paid volunteers enrolled in

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undergraduate educational psychology at SUNY at Albany. The battery consisted of four cloze forms and two measures each for speed of closure, flexibility of closure, associational fluency, and vocabulary. A brief description of each test follows. Complete descriptions of all verbal and perceptual ability measures can be found in the Kit of Reference Tests for Cognitive Factors (French, Ekstrom & Price, 1963).

Speed of Closure

The speed of closure factor is defined as the ability to unify an apparently disparate perceptual field into a single percept.

a. Gestalt Completion Test (test suggested by the Street Gestalt Completion Test). Drawings are presented which are composed of black blotches representing parts of the objects being portrayed. The subject writes down the name of the objects, being as specific about them as he can.

b. Concealed Words Test (test suggested by Thurstone's Mutilated Words). Words are presented with parts of each letter missing. The subject is to write out the full word in an adjacent space.

Flexibility of Closure

The flexibility of closure factor is defined as the ability to keep one or more definite configurations in mind so as to make identification in spite of perceptual distractions.

a. Hidden Patterns Test (test suggested by Thurstone's designs). Each item consists of a given geometrical pattern in some of which a single given configuration is embedded. The task is to mark each pattern in which the configuration occurs.

b. Hidden Figures Test (Adaptation of the Gottschaldt Figures Test popularized by Thurstone). The task is to decide which of five geometrical figures is embedded in a complex pattern. The difficulty level of this test is high.

Associational Fluency

The associational fluency factor is the ability to produce words from a restricted area of meaning.

a. Controlled Associations Test (test adapted from Thurstone's test of this name). The task is to write as many synonyms as possible (up to 12) for each of four words.

b. Association IV (a test by J. P. Guilford). The task is to produce a word that is associated with both the two given words but which has different meaning in its relationships to each of them.

Verbal Comprehension

The verbal comprehension factor is defined as the ability to understand the English language.

a. Wide Range Vocabulary Test (adopted from Cooperative Vocabulary Test). This is a five-choice synonym test having items ranging from very each to very difficult.

b. Advanced Vocabulary Test (adopted from a test by J. B. Carroll.) This is a four-choice synonyms test consisting mainly of difficult items.

The Cloze Tests

All cloze tests were, so-called, "pretests." That is, the Ss did not read the relevant passages in their intact form before attempting to complete the deleted units. A standard underline of 15 spaces was substituted for deleted words, and Ss recorded their responses directly on the test pamphlets.

The cloze materials were constructed from materials which had previously been ordered by difficulty level by means of the cloze procedure (Miller & Coleman). The 36, 150-word passages were divided into four groups of nine passages each. Sets of three sentences each were drawn from each of these four levels of difficulty until the required number of deletions were obtained.

a. Structural cloze. This is an "any-word" deletion which follows Taylor's (1954) original technique. Every fifth word is deleted regardless of its grammatical relationship.

b. Lexical cloze. This deletion is constructed by first identifying all the nouns, verbs, and adjectives in the passage and then eliminating every fifth noun, verb, or adjective.

c. Abstract nouns. Abstract nouns describe "objects" that cannot be perceived by the senses. Abstract nouns in the passages were identified first, and then a mechanical fifth-word deletion of these nouns carried out.

d. Concrete nouns. Concrete nouns were first identified (by choosing those nouns which did describe objects perceivable by the senses) and every fifth concrete noun deleted.

Data obtained from both samples were separately intercorrelated and subjected to a principal components solution. The original high school study reported two, three, and four factor solutions rotated to both varimax and maxplane criteria. This report contrasts the three factor solutions for each set of data after rotation of the principal component structure to the varimax criterion.

Tables 1 and 2 summarize the descriptive statistics including correlations, means, and standard deviations for the college and high school samples respectively.

Insert Tables 1 and 2 about here

Inspection of Tables 1 and 2 discloses marked differences between the systems of correlations for the high school and college samples. For the high school sample 65 of 66 correlations are significant ($p < .05$) whereas for the college sample 32 of 66 are significant. Further, of 16 perceptual ability correlations with cloze tasks, 15 are significant for the high school sample, and 5 for the college sample. Similarly, all of the verbal ability measures are significantly related to the cloze tasks for the high school sample whereas 10 of 16 are for the college sample. Perhaps more importantly, the magnitude of the relationships for the college sample are considerably less than for the high school group. Within cloze task correlations are also lower for the college group. In general the means for the college sample are substantially higher than for the high school group without exception.

The foregoing summary is supported by the components analyses of the respective correlation matrices. For the high school sample only two latent roots exceeded unity whereas three roots exceeded unity for the college sample again indicating greater positive manifold for the high school sample. Table 3 presents three factor solutions rotated to the varimax criterion for each of the samples.

Insert Table 3 about here

Inspection of Table 3 indicates that the three factor solution for the two samples bear certain similarities to each other. The first factor, in both instances, is a general cloze factor. The major discrepancy results from the altered loadings for the associational fluency tasks. For the high school samples Controlled Associations and Associations IV have major loadings on this factor whereas for the college sample they are nil. This reflects, in a parsimonious manner, the lack of dependence of cloze performance upon associational abilities for the older sample.

The second factor, in both analyses, is a perceptual factor, with all perceptual tests exhibiting their highest loadings. For the high school sample, the relationships between perceptual abilities and cloze is masked in a varimax solution. A rotation to the maxplane criterion produced a correlation of .47 between the two factors with the Structural and Concrete cloze tests having the highest loadings on the cloze factor. (See Table IV.) A similar finding is demonstrated in the college sample with the Concrete cloze task loading directly on the perceptual factor. The decreased positive manifold in the college group has produced a system of correlations to which an orthogonal set of factors demonstrates a superior "simple structure" fit. It should be pointed out, however, that the underlying correlations of closure tests to cloze performance are lower for the college group.

Factor III is a verbal ability factor dominated in both instances by the vocabulary tests. For the high school sample Lexical and Abstract Cloze tasks loaded on this factor due to the relatively strong correlations of these tasks with the verbal ability measures. The maxplane (Table 4)

rotation represents these results in a different way but can be interpreted in the same manner. Factor III for the college sample represents a cleaner break of the verbal abilities from both cloze and closure abilities. Thus, for the college sample, Lexical and Abstract cloze demonstrate markedly less dependence on the verbal ability measures.

DISCUSSION

In summary, both data sets indicate that the cloze tasks are factorially complex in that some tasks load on two factors. The high school data demonstrate a stronger positive manifold with cloze performance demonstrating greater dependence on vocabulary, associational fluency, and to a lesser extent upon closure abilities. The data seem to be consistent with a differentiation hypothesis with the data system elements displaying a general decrease in the magnitude of the intercorrelations when the college sample is contrasted with the high school group. Rankin (1965) suggested that closure factors would be more important in the performance of cloze tasks when contrasted with older Ss. These data, although trending in that direction, are not convincing. A study employing elementary school Ss, similar to those reported here, would be useful in further evaluating such a hypothesis.

Increased emphasis might be profitably placed on re-examining the assumptions underlying the construction and use of certain cloze tests, as well as exploring a broader range of deletion strategies suggested by a number of linguistic analyses. Although the cloze procedure has been put to extensive use, it has not been without its critics who have registered some reservations, a few of which may be worth heeding. Schlesinger (1968) advised against the continued use of the cloze

technique, particularly if there was under question what he calls the "fine-grain structure of a sentence." Although his case is somewhat overdrawn, inasmuch as few researchers using the cloze technique would contend that they are concerned with the fine-grain structure of one or a set of sentences, Schlesinger cites two versions of a text and then proceeds to show what a cloze task would look like if every 2nd word were deleted:

(1) After the two friends had eaten their meal, they set out to explore the neighboring forest.

(2) The two friends, after they had eaten their meal, set out to explore the neighboring forest.

(1a) After _____ two _____ had _____ their _____, they _____ out _____ explore _____ neighboring _____.

(2a) _____ two _____, after they had _____ their _____, _____ out _____ explore _____ neighboring _____. (1968:11)

Schlesinger's example admittedly is extreme--deleting every 2nd word--but his over-all point is worth noting: deletion strategies focusing on the linguistic variable of word order or sentence structure should be developed. Rather than continuing to rely almost exclusively on the grammatical elements of a sentence, conventionally defined by establishing word classes or referring to parts of speech or word categories (i.e., abstract, concrete, lexical, and structural) which are treated as isolated entities, or "averaged," deletion strategies incorporating the grammatical relational nature of these word classes are worth considering as a means of refining some of the strategies currently employed. Much the same point of view has been expressed by Pike (1969) who showed proximity alone to be an inadequate index of such structural relationships as, for example,

subject-verb, by citing the two following sentences which differed only in their surface structures:

The villagers, despite an outward acquiescence, resisted change.

Despite an outward acquiescence, the villagers resisted change. Pike (1969:11)

Whether one opts for deep or surface structure explanations, generative or interpretative semantics, or simply tries to steer clear of this complex and controversial area, it seems clear that to treat as identical even surface structure differences in language functions contributes little to an increased understanding of the phenomenon under investigation. In the present study an instance of not recognizing or acknowledging such differentiated functions can be found, for example, in the treatment of deleted nouns where no distinction is made between those nouns which serve as subject-nouns and those which serve as object nouns. Another source of speculation might be sets of lexical-deletion materials where, compared to the structural-deletion materials, a disproportionate number of main verbs has been deleted, thus perhaps posing a severe disadvantage if much weight is given to the notion that "subjects may tend to focus on the component of a sentence that is most central to its meaning or conveys the greatest amount of information, as is generally true of the predicate phrase in a statement (Snyder and Hale, 1971:10)."

The difference in degree of dependence, particularly on vocabulary and associational fluency, as is indicated by the comparative high school and college data of this report, suggests that to take into account only words in isolation (vocabulary) and isolated associations, while ignoring structural, that is syntactic, relations within a sentence, can provide only partial insights into the undoubtedly complex semantic, syntactic,

and associational relationships within sentences. Pike (1969) has demonstrated this point in his study of structural aspects of contextual constraint within sentences, wherein his findings reflect not only the worth of incorporating one or another scheme of structural and semantic relationships, but also seem to demand a re-examination of the question of long-range constraint as well as the assumption that context influences predictability in only one direction--two constraint characteristics which are easily open to empirical test with a variety of cloze deletion strategies.

As for the adequacy of the criteria currently employed to develop cloze tests, some re-examination and a judicious pruning also would appear to be in order. In particular, the notions underlying the abstract/concrete distinction could bear a closer scrutiny than it generally receives. Kamman and Streeter's (1971) recent study, which compared Roger Brown's proposal that the number of known, inclusive superordinate subordinate words was the determinant of abstractness with abstractness defined in terms of empirical ratings based on accessibility to the senses, reported that "subjects appear to rate the abstractness of a generic noun in terms of the abstractness of its examplars."

> When asked whether or not ANIMAL is accessible to the senses as an object or thing, raters apparently translate ANIMAL into AN ANIMAL and accept some token image to represent the class. On the other hand, such patriarchs as CRIME, AMOUNT, and DISEASE are rated as more abstract just as their subordinates are. Possibly the words in these abstract hierarchies refer

> to intrinsically relational situations which cannot be demonstrated by finger-pointings or photographs (1971:303;306, emphasis added).

These findings suggest some refinements in the procedures for establishing an abstract noun category, thus eliminating a few glaring inconsistencies which one occasionally finds in materials currently in use. For example, while acknowledging in specified contexts the abstract noun-ness of such items as time, shape, and end (abstract deletions in the materials used in this reported sutdy), it is difficult to defend--even if one invokes only a rule of consistency--the labelling of girl as a concrete deletion and wife as an abstract deletion, to say nothing of allowing the words homes and ornaments as abstract deletions, and conversely, thousands as a concrete deletion, which, to make matters worse in this latter instance, functions as the grammatical subject of the sentence.

In sum, there seems to be a striking imbalance between the power and occasional elegence of the statistical techniques which can be and are used to assess the cloze procedure, and the hardly exploited linguistic variables which serve, at least implicitly, as one of the major underpinnings of the stimulus materials.

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Table 1

Correlations among variables with associated means and standard deviations (College sample)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	$\bar{X}$	s
1. Cloze I-Structural	-	55	33	36	17	15	28	22	21	25	38	47	23.62	6.44
2. Close II-Lexical		-	16	38	-04	-06	12	06	11	11	23	35	12.90	3.88
3. Cloze III-Concrete			-	19	29	14	27	26	12	32	13	20	21.79	5.11
4. Cloze IV-Abstract				-	00	-06	09	-05	05	09	27	25	20.02	4 61
5. Gestalt Completion					-	37	43	26	-08	22	-08	-05	16.68	3.83
6. Concealed Words						-	40	20	03	20	06	04	23.76	5.88
7. Hidden Patterns							-	52	05	23	03	08	66.11	16.51
8. Hidden Figures								-	10	10	-08	03	14.82	8.77
9. Controlled Associations									-	13	34	41	30.42	8.82
10. Associations IV										-	30	31	9.89	4.25
11. Wide Range Vocabulary											-	78	19.22	6.50
12. Advanced Vocabulary												-	25.68	5.01

n=92, $r \geq .20$, $p < .05$
$r \geq .26$, $p < .01$

Table 2

Correlations among variables with associated means and standard deviations (High school sample)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	$\bar{X}$	SD
1. Cloze I-Structural	-	42	48	45	24	28	27	40	50	38	42	34	14.56	7.84
2. Cloze II-Lexical		-	42	52	24	25	15	22	44	34	43	45	7.53	4.03
3. Cloze III-Concrete			-	49	27	20	24	32	44	36	39	37	16.22	7.21
4. Cloze IV-Abstract				-	24	32	21	28	37	44	53	42	12.51	5.58
5. Gestalt Completion					-	42	45	38	38	28	26	28	16.34	5.82
6. Concealed Words						-	55	46	39	35	33	36	13.80	4.29
7. Hidden Patterns							-	47	20	18	32	22	42.93	22.06
8. Hidden Figures								-	32	32	43	31	4.93	5.11
9. Controlled Associations									-	45	40	42	14.72	7.82
10. Associations IV										-	38	45	4.80	3.61
11. Wide Range Vocabulary											-	69	7.41	5.75
12. Advanced Vocabulary												-	4.37	4.60

NOTE: $N = 113$, $r \geq .24$, $p < .05$

TABLE 3
Loadings for Three Factor Solutions
High School and College Studies Juxtaposed

Variable	Factor					
	I hs	I c	II hs	II c	III hs	III c
1. Cloze I-Structural	75	69	22	31	14	07
2. Cloze II-Lexical	56	81	02	00	50	17
3. Cloze III-Concrete	75	30	14	50	17	10
4. Cloze IV-Abstract	56	74	10	-04	50	33
5. Gestalt Completion	27	-02	68	73	04	-09
6. Concealed Words	13	-20	74	63	26	16
7. Hidden Patterns	05	14	83	79	10	02
8. Hidden Figures	24	08	67	55	20	-05
9. Controlled Associations	69	-03	27	01	18	66
10. Associations IV	47	04	22	39	40	48
11. Wide Range Vocabulary	24	24	25	-08	81	84
12. Advanced Vocabulary	20	33	19	00	84	83

Table 4
Maxplane * Solution for High School Sample

Variable	Factor		
	I hs	II hs	III hs
1. Cloze I-Structural	64	05	-43
2. Cloze II-Lexical	81	-19	04
3. Cloze III-Concrete	68	-05	-40
4. Cloze IV-Abstract	80	-10	-04
5. Gestalt Completion	07	67	-16
6. Concealed Words	11	74	09
7. Hidden Patterns	-10	38	04
8. Hidden Figures	18	64	-03
9. Controlled Associations	61	11	-36
10. Associations IV	63	05	-05
11. Wide Range Vocabulary	76	07	40
12. Advanced Vocabulary	76	00	45

* Factor I and II correlate .47. Factor III has essentially zero correlation with I and II.